DANA

MODELS 50, 55, & 58

INPUT FILTERS

MARCH 1967

INSTRUCTION MANUAL

980223

DANA™

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Telephone (714) 833-1234
Teletype 910-595-1136

Series 5600 DVM
Plug-In Accessories

Model 50, 55 and 58 Filters are adaptable to all Series 5600 instruments, reject line-frequency hum and all higher frequency noise superimposed on dc signals. Three models allow choice of rejection and setting times.

Model 20, 24 and 25 AC Converters convert ac voltages into proportional dc voltages, which are then measured by the DVM circuitry and displayed in rms voltage values. Models 24 and 25 have a bandwidth of 100 kHz; Model 20, a bandwidth of 20 kHz. Model 24 has programmable settling time.

Model 02 Ohms Converter translates dc resistances into dc voltages, which are then measured by the Series 5600 instrument and displayed as kilohms. Range selection and decimal point display are automatic.

Model 11 and 12 Preamplifiers increase the sensitivity of Series 5600 instruments by amplifying small dc signals. Resulting resolution on the lowest range is 0.1 microvolt. Readout is in millivolts, with automatic placement of decimal point. Range selection is automatic or manual, at operator's option.

MODELS 50, 55, & 58 INPUT FILTERS

1.0 GENERAL DESCRIPTION

The Input Filter allows DC voltage measurements to be made in the presence of line frequency hum or other superimposed AC signals. Except for settling time, operation of the Digital Voltmeter is not disturbed by the filter. Three models of input filters are available: Model 50 is a passive filter; Models 55 and 58 are similar active filters.

Each filter is mounted on a plug-in circuit board which is installed in the designated position within the voltmeter. It obtains its power from the voltmeter power supply.

2.0 OPERATIONAL DESCRIPTION

Functionally, Models 55 and 58 are connected as damped three-pole capacitive multipliers (see Figure 1). The circuit is combined with the output resistance of the input divider to form an active RC filter network. Amplifier gain (-K) increases the effective value of C proportional to the cube of the input frequency. In the Model 55 filter, the amplifier feedback network is fixed; in Model 58, the gain of the amplifier is switched by changing the feedback network that establishes amplifier gain. This is done by an Attenuator switch on the board itself. AC rejection of the three filters is listed below:

SPECIFICATIONS	MODEL 50	MODEL 55	MODEL 58	
AC Rejection				
60 Hz and above	37 dB min	37 dB min	37 dB min	80 dB min
300 Hz and above	51 dB min	80 dB min	80 dB min	100 dB min
Settling time to within 0.01% with up to 100K source resistance	3.3 sec	350 msec	350 msec	1.5 sec
Maximum source resistance	1 megohm	1 megohm	1 megohm	1 megohm
Cutoff rate	6dB/octave	18dB/octave	18dB/octave	18dB/octave
AC input impedance 10v range	900k ohms min	900k ohms min	900k ohms min	900k ohms min
100 and 1000v ranges	9 megohms min	9 megohms min	9 megohms min	9 megohms min

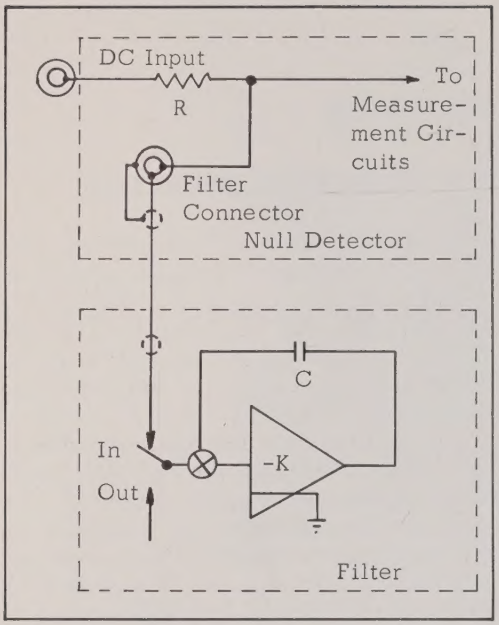


Figure 1. Model 55/58 Filter

Model 50 is a one section passive RC filter. This model provides 37 dB minimum rejection at 60 Hz and above and 51 dB minimum at 300 Hz and above.

Model 55 and 58 Filters include relays by which they are switched in and out of the Null Detector input circuit. In addition, a transistor switch generates a signal to the Timeout circuit on the Program circuit board to increase range and polarity delays to approximately 1-1/2 times the filter settling time.

If an active filter is not specified, the instrument is shipped with a Model 50 passive filter.

Referring to the schematics for Model 55 (430153) and Model 58 (430220), Q3 is a logical inverter. Q7, Q9 drive the filter in/out relay and Q13 serves as a switch connecting C7 to the "Timeout" circuit in the DVM, increasing ranging and polarity delays to approximately 1.5 times the filter settling time. The balance of the transistors Q2, Q4, Q5, Q6, Q10, Q11, Q8, and Q9, comprise the amplifier. In the Model 58 Filter the switch changes C2, C4, C9 and C7 to the appropriate value for the selected 60 cycle rejection.

3.0 INSTALLATION

The filter is installed merely by plugging it into the appropriate board position in the Digital Voltmeter; see the Digital Voltmeter instruction manual for location. The coaxial cable from the filter is plugged into the mating receptacle on the Null Detector circuit board.

4.0 OPERATION

In Dana Model 5600 and 5603 Digital Voltmeters, the filter is selected when the FILTER switch on the front panel is set to the IN position. The filter is selected in Model 5640 by setting the FUNCTION switch to a DCF (DC Filtered) function selection. In Model 5643, the filter is selected by setting the MODE switch to FILTERED.

When a Model 58 filter is used, the selection of either 37dB or 80dB rejection is made by a switch on the filter board (accessible with the right-hand front panel opened). In the up position of the switch, 80dB rejection is obtained. The down position results in 37dB rejection.

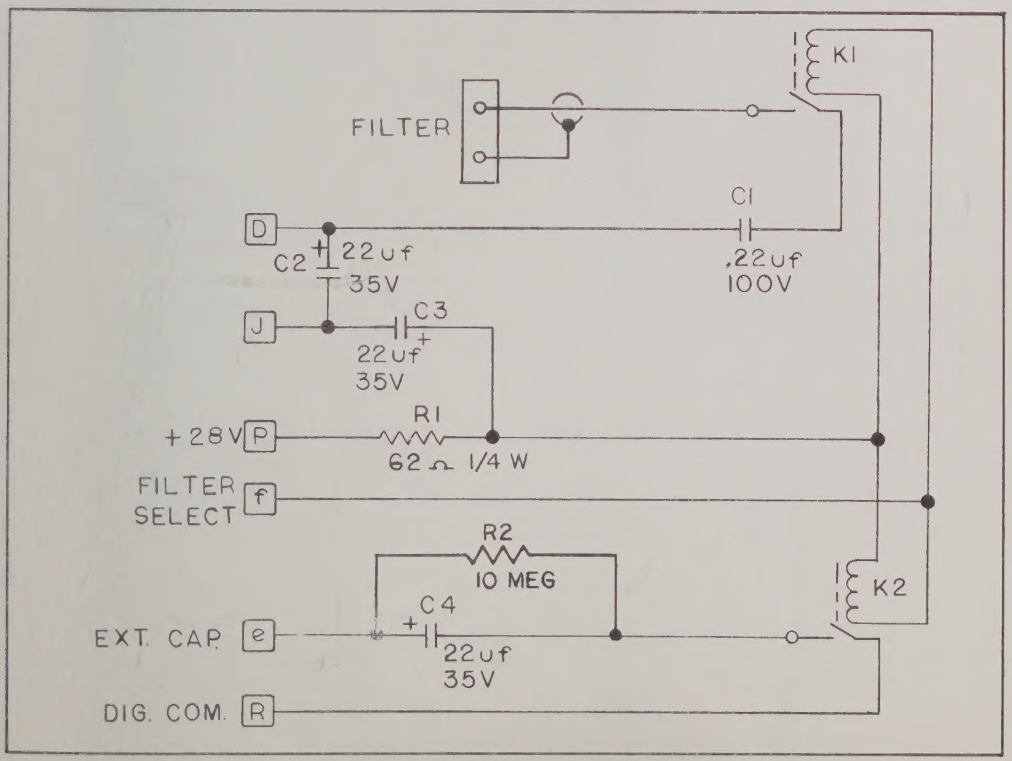
When using the filter, time must be allowed after each input change for the filter to settle to a new value. If automatic range or polarity changes are required, the period of the internal timeout circuit is automatically increased. If no range or polarity changes are involved, the operator must wait until the

reading becomes stable. Timeout periods of the filters are listed as follows; tolerance is ±25%:

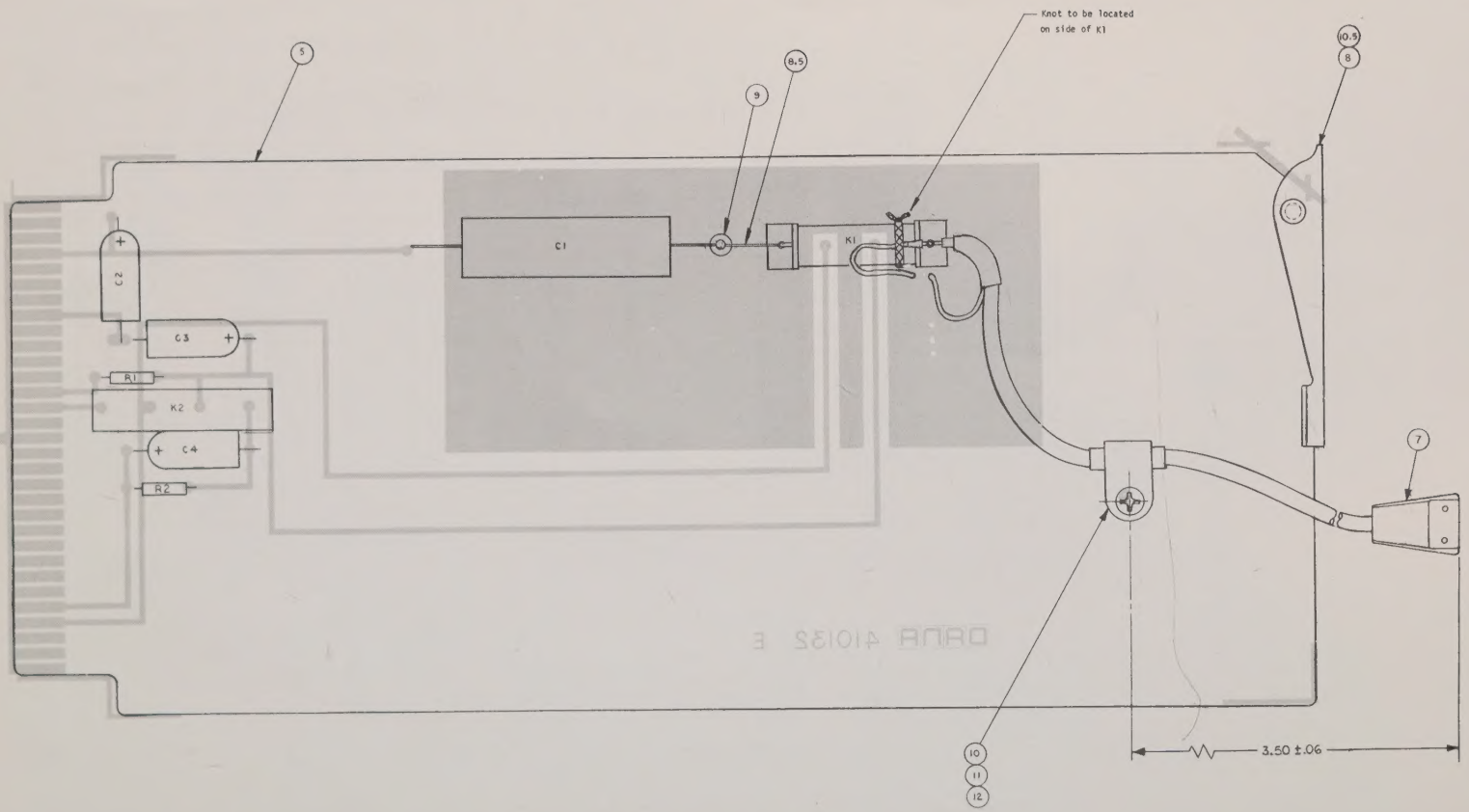
Model 50	3.3 seconds
Model 55	0.35 second
Model 58	0.35/1.5 seconds

MODEL 50 PARTS LIST (400346)

REF DES	DANA P/N	PART	TYPE	DESCRIPTION	MANUFAC	MANUFAC P/N
C1	120059	CAP	POLYS	.22 MFD 200 V 5%	CUBE	410B1C224J
C2	110002	CAP	TANTA	22 MFD 35 V 10%	KEMET	K22C35K
C3	110002	CAP	TANTA	22 MFD 35 V 10%	KEMET	K22C35K
C4	110002	CAP	TANTA	22 MFD 35 V 10%	KEMET	K22C35K
R1	000620	RES	CARBON	62 OHM 5% 1/4 W	OHMITE	RC07GF620J
R2	000106	RES	CARBON	10 M 5% 1/4 W	OHMITE	RC07GF106J
K1	310013	RELAY	REED	SPST 24V	WHEELOCK	2961A X6
K2	310016	RELAY	REED	SPST 24V	MCI	MCIEI-24S



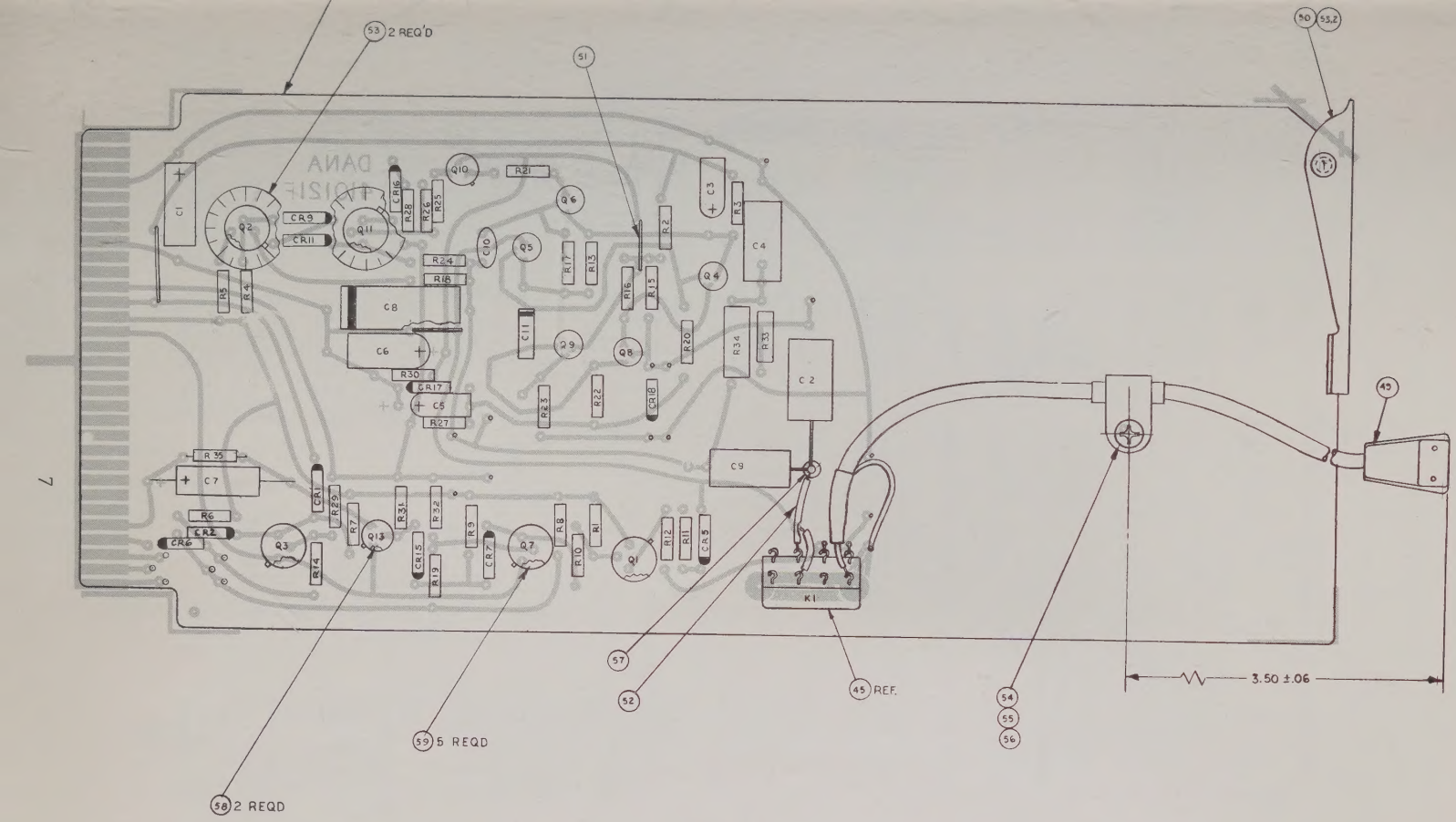
Schematic - Model 50



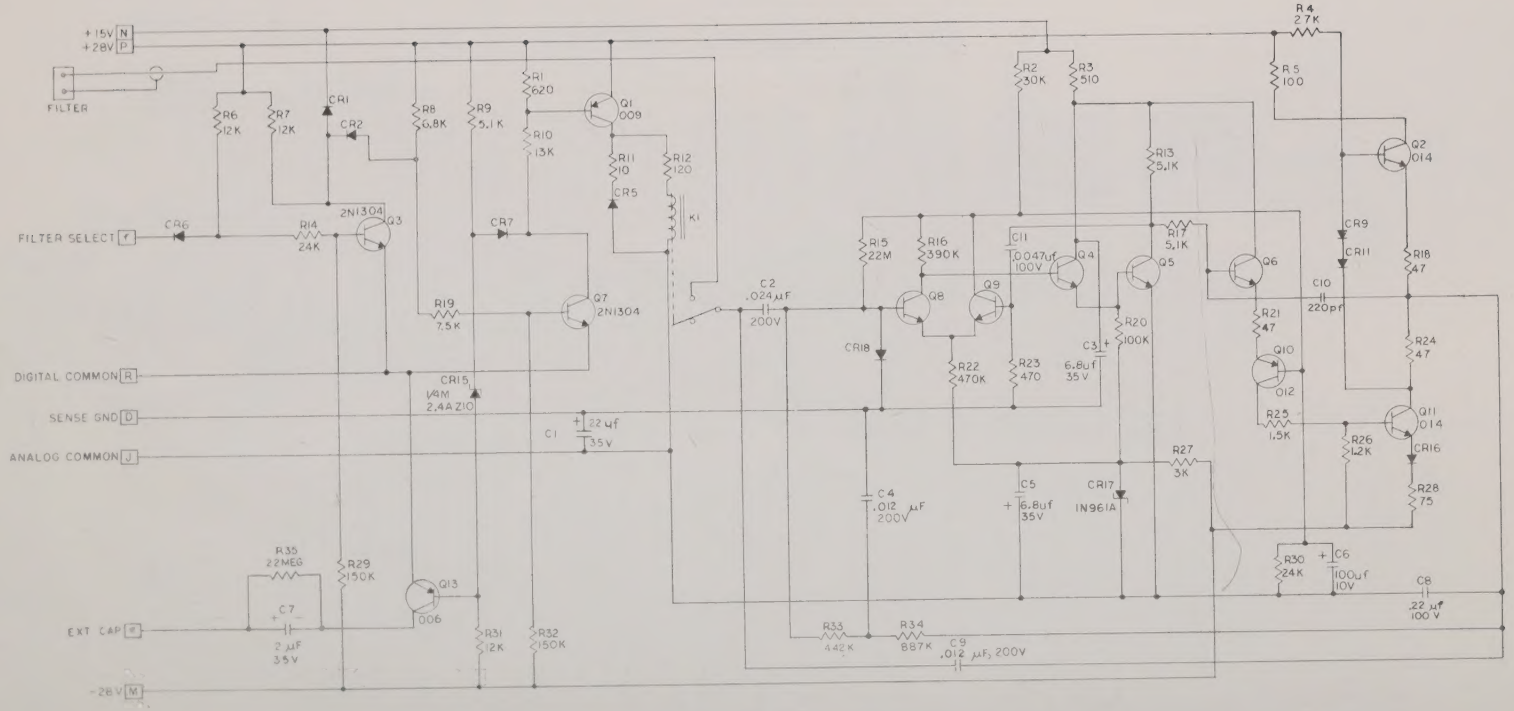
Assembly - Model 50

REF DES	DANA P/N	PART	TYPE	DESCRIPTION	MANUFAC	MANUFAC P/N
C1	110002	CAP	TANTA	22 MFD 35 V 10%	KEMET	K22C35K
C2	120057	CAP	POLYS	.012 MFD 200 V 5%	VEDCO	13W
C3	110001	CAP	TANTA	6.8 MFD 35 V 10%	KEMET	K6R8C35K
C4	120057	CAP	POLYS	.012 MFD 200 V 5%	VEDCO	13W
C5	110001	CAP	TANTA	6.8 MFD 35 V 10%	KEMET	K6R8C35K
C6	110006	CAP	TANTA	100 MFD 10 V 10%	KEMET	K100C10K
C7	110023	CAP	TANTA	2.2 MFD 35 V 10%	KEMET	K22C35K
C8	121393	CAP	MYLAR	.22 MFD 100 V 10%	CDE	WMF1P22
C9	120057	CAP	POLYS	.012 MFD 200 V 5%	VEDCO	13W
C10	101175	CAP	CERAM	220 PFD 500 V 10%	AEROVOX	SCD1X5F
C11	121146	CAP	MYLAR	.0047 MFD 100 V 10%	CDE	WMF1D47
K1	310026	RELAY			DANA	310026
CR1	211083	DIODE	SILICO	018	DANA	211083
CR2	211083	DIODE	SILICO	018	DANA	211083
CR5	211083	DIODE	SILICO	018	DANA	211083
CR6	211083	DIODE	SILICO	018	DANA	211083
CR7	211083	DIODE	SILICO	018	DANA	211083
CR9	211083	DIODE	SILICO	018	DANA	211083
CR11	211083	DIODE	SILICO	018	DANA	211083
CR15	221177	DIODE	SILICO	ZENER 1/4 W	MOTOROLA	M.2.4A25
CR16	211083	DIODE	SILICO	018	DANA	211083
CR17						
CR18	211083	DIODE	SILICO	018	DANA	211083
Q1	200011	TRANS	SILICO	PNP 009	DANA	200011
Q2	200035	TRANS	SILICO	NPN 014	DANA	200035
Q3	201084	TRANS	GERMAN	PNP 2N1304	TI	2N1304
Q4	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q5	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q6	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q7	201084	TRANS	GERMAN	PNP 2N1304	TI	2N1304
Q8	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q9	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q10	200022	TRANS	SILICO	PNP 012	DANA	200022
Q11	200035	TRANS	SILICO	NPN 014	DANA	200035
Q13	201111	TRANS	GERMAN	PNP 006	DANA	201111
R1	000621	RES	CARBON	620 OHM 5% 1/4 W	OHMITE	RC07GF621J
R2	000303	RES	CARBON	30 K 5% 1/4 W	OHMITE	RC07GF303J
R3	000511	RES	CARBON	510 OHM 5% 1/4 W	OHMITE	RC07GF511J
R4	000273	RES	CARBON	27 K 5% 1/4 W	OHMITE	RC07GF273J
R5	000101	RES	CARBON	100 OHM 5% 1/4 W	OHMITE	RC07GF101J

REF DES	DANA P/N	PART	TYPE	DESCRIPTION			MANUFAC	MANUFAC P/N
R6	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RC07GF123J
R7	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RC07GF123J
R8	000682	RES	CARBON	6.8	K	5% 1/4 W	OHMITE	RC07GF682J
R9	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RC07GF512J
R10	000133	RES	CARBON	13	K	5% 1/4 W	OHMITE	RC07GF133J
R11	000100	RES	CARBON	10	OHM	5% 1/4 W	OHMITE	RC07GF100J
R12	000121	RES	CARBON	120	OHM	5% 1/4 W	OHMITE	RC07GF121J
R13	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RC07GF512J
R14	000243	RES	CARBON	24	K	5% 1/4 W	OHMITE	RC07GF243J
R15	000226	RES	CARBON	22	M	5% 1/4 W	OHMITE	RC07GF226J
R16	000394	RES	CARBON	390	K	5% 1/4 W	OHMITE	RC07GF394J
R17	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RC07GF512J
R18	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RC07GF470J
R19	000752	RES	CARBON	7.5	K	5% 1/4 W	OHMITE	RC07GF752J
R20	000104	RES	CARBON	100	K	5% 1/4 W	OHMITE	RC07GF104J
R21	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RC07GF470J
R22	000474	RES	CARBON	470	K	5% 1/4 W	OHMITE	RC07GF474J
R23	000471	RES	CARBON	470	OHM	5% 1/4 W	OHMITE	RC07GF471J
R24	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RC07GF470J
R25	000152	RES	CARBON	1.5	K	5% 1/4 W	OHMITE	RC07GF152J
R26	000122	RES	CARBON	1.2	K	5% 1/4 W	OHMITE	RC07GF122J
R27	000302	RES	CARBON	3	K	5% 1/4 W	OHMITE	RC07GF302J
R28	000750	RES	CARBON	75	OHM	5% 1/4 W	OHMITE	RC07GF750J
R29	000154	RES	CARBON	150	K	5% 1/4 W	OHMITE	RC07GF154J
R30	000243	RES	CARBON	24	K	5% 1/4 W	OHMITE	RC07GF243J
R31	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RC07GF123J
R32	000154	RES	CARBON	150	K	5% 1/4 W	OHMITE	RC07GF154J
R33	010067	RES	METAL	442	OHM	1% 1/4 W	ELECTRA	RN60D4420F
R34	010166	RES	METAL	17.8	K	1% 1/4 W	ELECTRA	RN60D1782F
R35	000226	RES	CARBON	22	M	5% 1/4 W	OHMITE	RC07GF226J



Assembly - Model 55



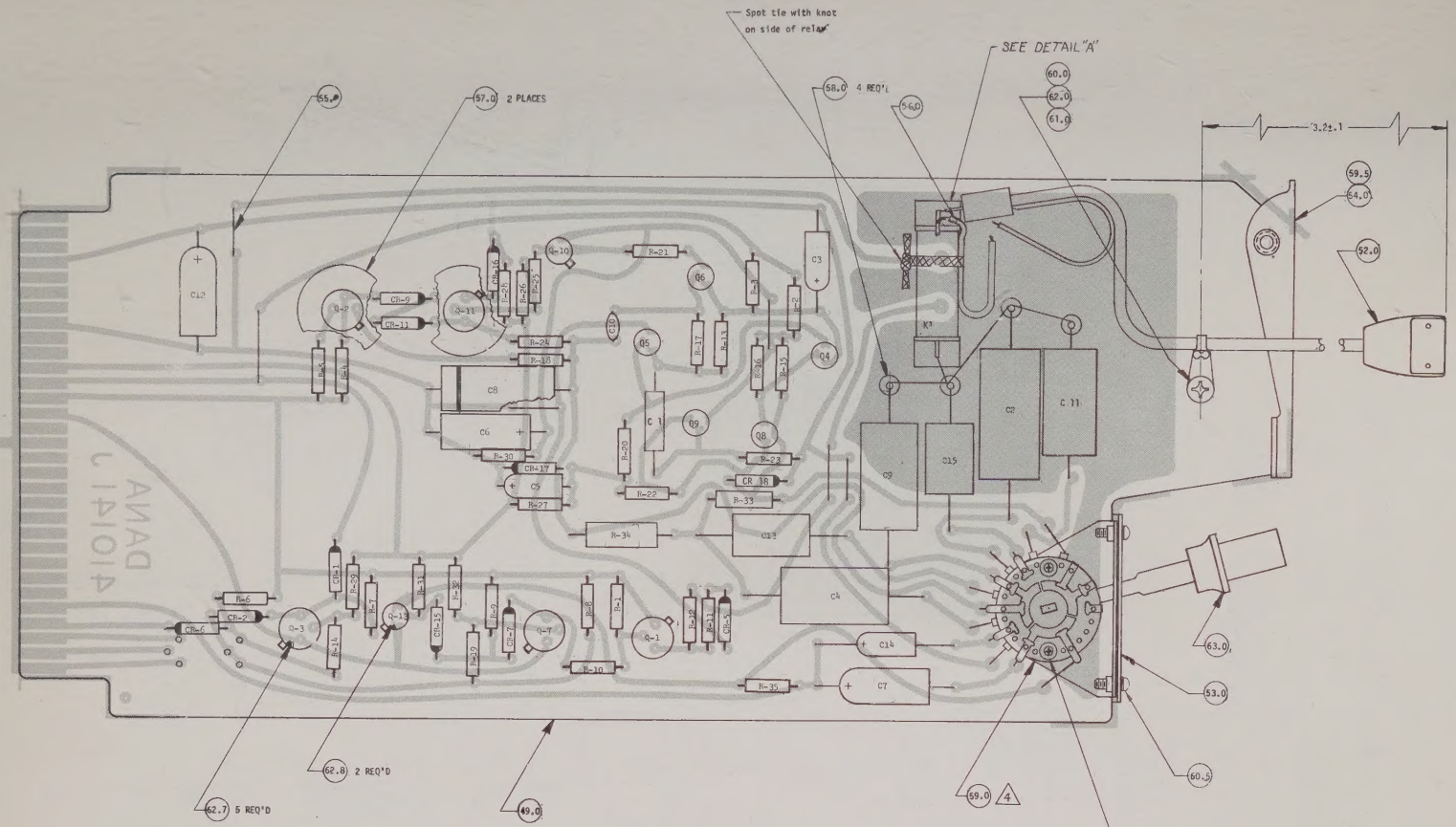
Schematic - Model 55

PCB ASSEMBLY P/N 400373 ACTIVE FILTER

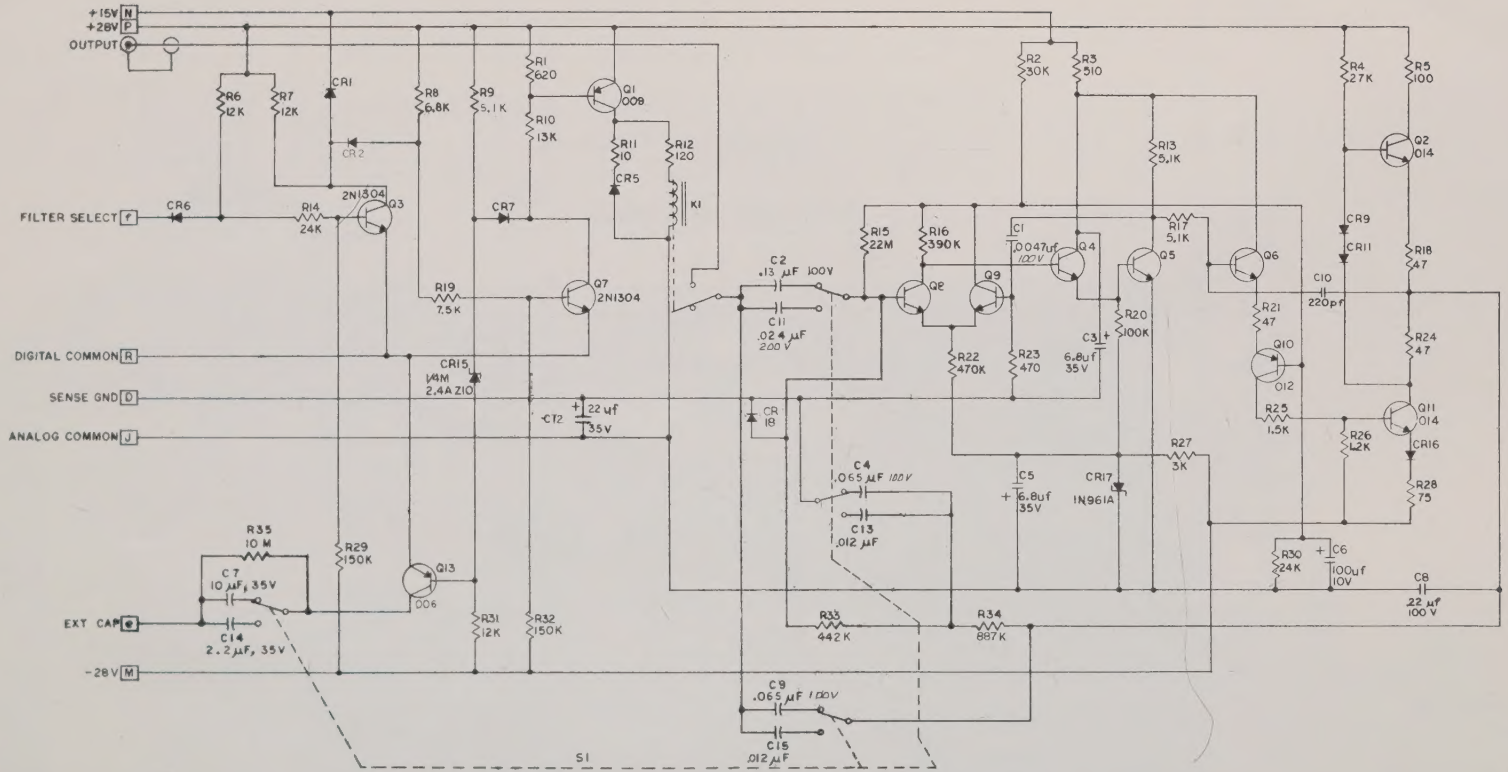
REF DES	DANA P/N	PART	TYPE	DESCRIPTION	MANUFAC	MANUFAC P/N
C1	121146	CAP	MYLAR	.0047 MFD 100 V 10%	CDE	WMF1D47
C2	120061	CAP	POLYS	.13 MFD 100 V 10%	ELPAC	PD1J134J
C3	110001	CAP	TANTA	6.8 MFD 35 V 10%	KEMET	K6R8C35K
C4	120060	CAP	POLYS	.065 MFD 100 V 10%	ELPAC	PD14653J
C5	110001	CAP	TANTA	6.8 MFD 35 V 10%	KEMET	K6R8C35K
C6	110006	CAP	TANTA	100 MFD 10 V 10%	KEMET	K100C10K
C7	110020	CAP	TANTA	10 MFD 35 V 10%	KEMET	K10C35K
C8	Delete					
C9	120060	CAP	POLYS	.065 MFD 100 V 10%	ELPAC	PD14653J
C10	101175	CAP	CERAM	220 PFD 500 V 10%	AEROVOX	SCD1X5F
C11	120052					
C12	110002	CAP	TANTA	22 MFD 35 V 10%	KEMET	K22C35K
C13	120057	CAP	POLYS	.012 MFD 200 V 5%	VEDCO	13W
C14	110023	CAP	TANTA	2.2 MFD 35 V 10%	KEMET	K22C35K
C15	120057	CAP	POLYS	.012 MFD 200 V 5%	VEDCO	13W
CR1	211083	DIODE	SILICO	018	DANA	211083
CR2	211083	DIODE	SILICO	018	DANA	211083
CR5	211083	DIODE	SILICO	018	DANA	211083
CR6	211083	DIODE	SILICO	018	DANA	211083
CR7	211083	DIODE	SILICO	018	DANA	211083
CR9	211083	DIODE	SILICO	018	DANA	211083
CR11	211083	DIODE	SILICO	018	DANA	211083
CR15	221177	DIODE	SILICO	ZENER 1/4 W	MOTOROLA	M.2.4A25
CR16	211083	DIODE	SILICO	018	DANA	211083
CR17	220004	DIODE	SILICO	ZENER 1N961B	MOTOROLA	1N961B
CR18	211083	DIODE	SILICO	018	DANA	211083
K1	310013	RELAY	REED	SPST 24V	WHEELOCK	2961A X6
Q1	200035	TRANS	SILICO	NPN 014	DANA	200035
Q2	200011	TRANS	SILICO	PNP 009	DANA	200011
Q3	201084	TRANS	GERMAN	PNP 2N1304	TI	2N1304
Q4	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q5	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q6	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q7	201084	TRANS	GERMAN	PNP 2N1304	TI	2N1304
Q8	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q9	200043	TRANS	SILICO	NPN 2N3565	FAIRCHILD	2N3565
Q10	200022	TRANS	SILICO	PNP 012	DANA	200022
Q11	200035	TRANS	SILICO	NPN 014	DANA	200035
Q13	201111	TRANS	GERMAN	PNP 006	DANA	201111

PCB ASSEMBLY P/N 400373 ACTIVE FILTER

REF DES	DANA P/N	PART	TYPE	DESCRIPTION			MANUFAC	MANUFAC P/N
R1	Q00621	RES	CARBON	620	OHM	5% 1/4 W	OHMITE	RCO7GF621J
R2	000303	RES	CARBON	30	K	5% 1/4 W	OHMITE	RCO7GF303J
R3	000511	RES	CARBON	510	OHM	5% 1/4 W	OHMITE	RCO7GF511J
R4	000273	RES	CARBON	27	K	5% 1/4 W	OHMITE	RCO7GF273J
R5	000101	RES	CARBON	100	OHM	5% 1/4 W	OHMITE	RCO7GF101J
R6	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RCO7GF123J
R7	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RCO7GF123J
R8	000682	RES	CARBON	6.8	K	5% 1/4 W	OHMITE	RCO7GF682J
R9	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RCO7GF512J
R10	000133	RES	CARBON	13	K	5% 1/4 W	OHMITE	RCO7GF133J
R11	000100	RES	CARBON	10	OHM	5% 1/4 W	OHMITE	RCO7GF100J
R12	000121	RES	CARBON	120	OHM	5% 1/4 W	OHMITE	RCO7GF121J
R13	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RCO7GF512J
R14	000243	RES	CARBON	24	K	5% 1/4 W	OHMITE	RCO7GF243J
R15	000226	RES	CARBON	22	M	5% 1/4 W	OHMITE	RCO7GF226J
R16	000394	RES	CARBON	390	K	5% 1/4 W	OHMITE	RCO7GF394J
R17	000512	RES	CARBON	5.1	K	5% 1/4 W	OHMITE	RCO7GF512J
R18	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RCO7GF470J
R19	000752	RES	CARBON	7.5	K	5% 1/4 W	OHMITE	RCO7GF752J
R20	000104	RES	CARBON	100	K	5% 1/4 W	OHMITE	RCO7GF104J
R21	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RCO7GF470J
R22	000474	RES	CARBON	470	K	5% 1/4 W	OHMITE	RCO7GF474J
R23	000471	RES	CARBON	470	OHM	5% 1/4 W	OHMITE	RCO7GF471J
R24	000470	RES	CARBON	47	OHM	5% 1/4 W	OHMITE	RCO7GF470J
R25	000152	RES	CARBON	1.5	K	5% 1/4 W	OHMITE	RCO7GF152J
R26	000122	RES	CARBON	1.2	K	5% 1/4 W	OHMITE	RCO7GF122J
R27	000302	RES	CARBON	3	K	5% 1/4 W	OHMITE	RCO7GF302J
R28	000750	RES	CARBON	75	OHM	5% 1/4 W	OHMITE	RCO7GF750J
R29	000154	RES	CARBON	150	K	5% 1/4 W	OHMITE	RCO7GF154J
R30	000243	RES	CARBON	24	K	5% 1/4 W	OHMITE	RCO7GF243J
R31	000123	RES	CARBON	12	K	5% 1/4 W	OHMITE	RCO7GF123J
R32	000154	RES	CARBON	150	K	5% 1/4 W	OHMITE	RCO7GF154J
R33	010167	RES	METAL	442	K	1% 1/4 W	ELECTRA	RN60D4423F
R34	010166	RES	METAL	887	K	1% 1/4 W	ELECTRA	RN60D8873F
R35	000106	RES	CARBON	10	M	5% 1/4 W	OHMITE	RCO7GF106J



Assembly - Model 58



Schematic - Model 58

DANA

MP MASTER
MA30576